FS METEOR Cruise M148

May 24 to June 29, 2018
Belém (Brazil) – Walvis Bay (Namibia)

2nd Weekly Report, June 3, 2018

The work program off Brazil was completed successfully during the second week of the cruise. Subsequently, R/V METEOR left the exclusive economic zone of Brazil on Friday night. Since then we are conducting full-depth hydrographic measurements on a transatlantic section along 11°S. The section will be concluded upon reaching the continental slope of Angola in Africa in about two weeks.

The dataset from the measurement program off Brazil and the transatlantic hydrographic section will be used to determine the variability of the Atlantic meridional overturning circulation (AMOC). The AMOC transports large amounts of heat northward and strongly contributes to the mean climate state and decadal to multi-decadal climate variability in the Atlantic sector. The strength of the AMOC is continuously measured by observing systems installed at several different latitudes in the Atlantic: The RAPID-MOCHA array at 26°N, the OSNAP array in the subpolar gyre of the North Atlantic, the MOVE array at 16°N and the SAMBA/SAMOC array at 34°S. For climate research, it is particularly important to rationalize the meridional coherence of AMOC signals propagating from the South Atlantic toward the subpolar North Atlantic or vice versa. The tropical AMOC observing system at 11°S is thus representing a key link between North and South Atlantic MOC variability.

The mean and seasonal to interannual variability of the AMOC at 11°S is determined by constructing a transport time series from different observing systems. Transports of the western boundary currents are determined from a current meter mooring array at 11°S off Brazil. This mooring array was serviced during R/V METEOR cruise M145 led by Peter Brandt and Rebecca Hummels in March 2018. Eastern boundary current transports are derived from a current meter mooring array installed off Angola at 11°S. Bottom pressure sensors (Fig. 1) installed on the Brazilian and Angolan continental slope are used to determine the zonal-mean meridional transport in the upper 500m of the water column across the

Fig. 1: Deployment of a bottom pressure sensor (photo: Martina Nielsen).

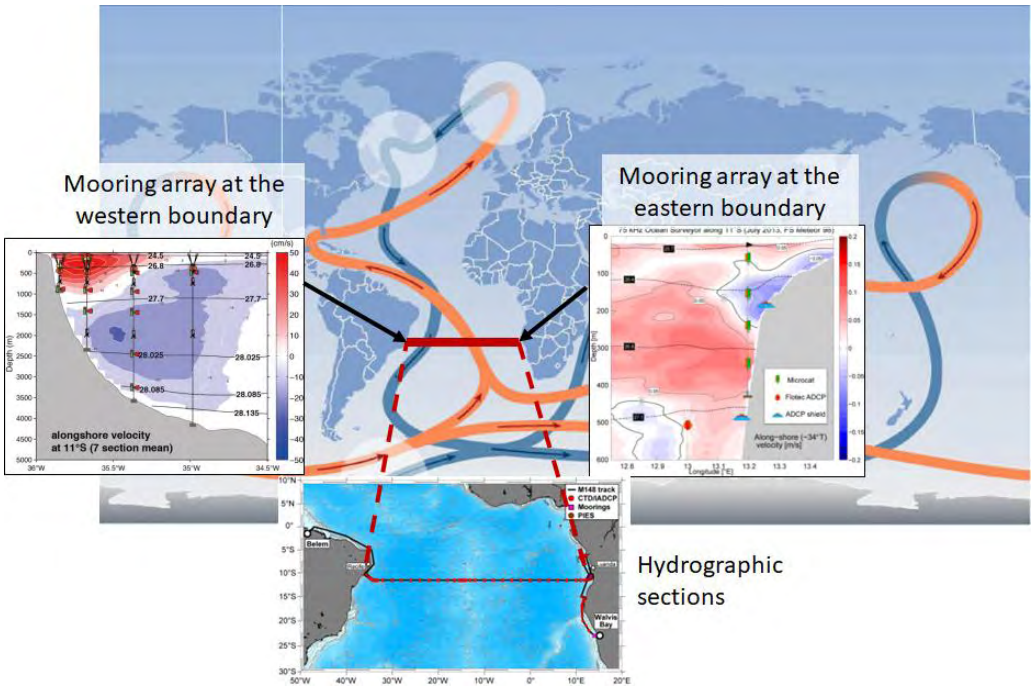

Fig. 2: Components of the tropical AMOC observing system at 11°S.

Atlantic at 11°S. Finally, repeated hydrographic measurements obtained from research cruises compliment the tropical AMOC in the southern hemisphere (Fig. 2).

To date, no reference estimates of the strength of the AMOC is available for the period during which our observing system is installed. The full-depth hydrographic measurements will provide such a reference estimate that will help to detect strengths and weaknesses of the installed observational system. Additionally, the hydrographic data will allow investigating temporal changes in water mass properties in the deep tropical South Atlantic.

Two bottom pressure sensors were installed on the continental slope in 300m and 500m depth last Wednesday, complementing the AMOC observing system. Furthermore, a full-depth hydrographic and velocity section across the continental slope of Brazil was successfully completed (Fig. 3). The observations indicated an extensive deep western boundary current below 1000m depth having two velocity cores. The offshore southward core

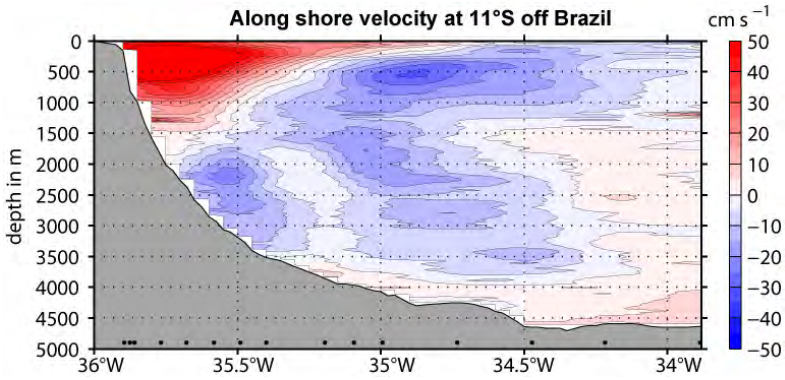

Fig. 3 Alongshore currents in the western tropical Atlantic at 11°S.

together with the northward flow at 34°W is likely part of an anticyclontic eddy. Deep Western Boundary Current eddies are known to be predominately responsible for the southward transport of the deep water at this latitude. In the upper 1000m of the water column, the northward North Brazil Undercurrent at the continental slope was accompanied by an elevated offshore recirculation.

The atmosphere on board has remained excellent and we are enjoying the outstanding collaboration with Rainer Hammacher and his crew.

Best regards from the tropical South Atlantic,

Marcus Dengler and the participants of M148